large horizontal surface of wire will fall vertically upon the same horizontal surface of ground. We do not see how the moisture caught by 2 square feet of wire network 8 yards above the ground, or that caught by a single loop of wire 2 feet square can be concentrated upon an area of 3 inches square at 1 meter above the ground, or upon a single point at the ground, unless there be some arrangement like a funnel to concentrate the drip.

But apart from any question as to the accuracy of our correspondent's logic, we are inclined to believe that woven wire network, such as is used for fences, may constitute an excellent arrangement for catching fog, mist, and dew. Why can not the network be placed vertically, or nearly so, as suggested on page 466 of the MONTHLY WEATHER REVIEW for October, 1898, so that the vertical drip may be led directly into the ground or to the roots of plants by appropriate small inclined gutters.

With regard to the amount of drip caught in these experiments by Mr. Betts, we make the following calculation: He states that he caught the drip from a common fence wire netted in 6-inch squares and stretched horizontally between four poles 7 feet above the ground and covering an area of 7 by 7 feet equal 49 square feet. There were, therefore, 196 open spaces, each 6 inches square, and the total length of wire was 105 linear feet. The drip from this was caught in a tin basin, nearly cylindrical, 9 inches in diameter and 3 inches deep. During the whole forty days a depth of 1.58 inch was collected. This is equivalent to $1.58 \times 4.5 \times 4.5 \times 3.1416 = 100.5$ cubic inches. If this total amount of drip be divided by the area (49 square feet) over which it was collected, we find that it would cover this whole area to a depth of about $\frac{1}{7\frac{1}{5}}$ of an inch. On the other hand, the sum total of the water caught by Mr. Betts in his rain gage in the form of dew was 0.13 in depth. But in this case the dew in the gage must have been deposited on the area of the gage mouth itself; that is to say, the depth, 0.13 on the bottom of the gage or the basin would also have been caught over the whole of the 49 square feet, or for that matter over the whole of a large field. We should say, therefore, that the drip from the fog and mist as caught on the wire screen represents an average depth of water over the field of $\frac{1}{7\frac{1}{5}}$ of an inch, but that the dew represents one-seventh or one-eighth of an inch. Since, therefore, the dew is in this case ten times that of the drip, it is evident that in Iowa the utilization of the dew is more important to irrigation than that of the drip. On the other hand, there may well be regions where the dew is less important and the drip more important. In such cases we doubt not that a thickly set system of woven fence wire in parallel vertical frames may catch enough drip to be an important aid in the irrigation of a small portion of the ground.—ED.

CLIMATOLOGY OF THE ISTHMUS OF PANAMA.[1]

By Gen. H. L. ABBOTT (dated Paris July 12, 1899.)

I enclose the latest figures with respect to rainfall. The complete series for three stations is given in the following table: Gorgona, being near Gamboa, has been lately abandoned as a gaging station:

Bohio.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1898...	12.36	1.26	3.03	10.59	14.61	19.76	34.96	38.31	13.31	28.23	21.81	6.38	204.61
1899...	9.41	4.49	3.27	11.30	10.36	14.80	.....	.....	.....	.....	.....	.....	.....

Gamboa.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1898...	2.76	0.12	0.00	1.42	5.32	4.65	18.43	20.16	4.10	8.70	14.57	2.40	82.60
1899...	5.00	1.73	1.34	1.42	8.54	8.78	.....	.....	.....	....	.....	.....	.....

Gorgona (now abandoned).

1898...	3.42	0.20	0.00	1.38	5.04	4.37	18.50	19.88	.....	7.72	9.61	3.94	[78.0]
1899...	3.78	2.01	3.31	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

[1] The Editor has received the following data from General Abbott, supplementary to his article in the MONTHLY WEATHER REVIEW for May, 1899.

I add a rough plot comparing your horary barometric curve at Colon with our mean at Panama. It is certainly gratifying to find so close an accordance. The entire diurnal range is very small, only $2\frac{1}{2}$ millimeters, or .1 of an inch. The difference in epoch is partly explained by your using seventy-fifth meridian time, while we use local time. As your observations are now discontinued, I thought it worth while to reduce the eight months that have been published in the MONTHLY WEATHER REVIEW. Many years ago, I had occasion to study similar diurnal curves in the interior of the North American continent in connection with our Pacific Railroad surveys, and found wide differences at the same place, due to changes of temperature. As such changes do not exist on the Isthmus, we ought to expect harmony between different series in that region and these two sets of observations, in my judgment, confirm this expectation.

The figures and curve given by General Abbott, for the hours of local mean time in the MONTHLY WEATHER REVIEW, May, 1899, pages 201–202, from three months' observations by Royer, at Panama, may be compared with the following table now given by him, as derived from eight months of Weather Bureau observations at Colon on seventy-fifth meridian time. Panama is in longitude 79° 30′ W.; Colon is in longitude 79° 50′ west. Therefore, the time scale of the Colon record for the Weather Bureau barograph still needs a subtractive correction of nineteen minutes in order to convert it into local mean time, and a similar correction of eighteen minutes in order to convert it into a simultaneous record on Panama mean time.

The hourly record for eight months, October 18, 1898, to May 20, 1899, at Colon is given in Table IV in the successive MONTHLY WEATHER REVIEWS, in English inches. It has been converted into millimeters by General Abbot, and has given him the following average departures from monthly mean values. The reconversion into inches has been added by the Editor. The Colon record from November, 1897, to January, 1898, is copied from General Abbot's previous paper. A long record of hourly readings at these two stations is greatly desired.

Mean barometric departures.

Hour.	Colon.		Panama.		Hour.	Colon.		Panama.	
	Mm.	*Inch.*	*Mm.*	*Inch.*		*Mm.*	*Inch.*	*Mm.*	*Inch.*
Midnight.	+ 0.53	+0.021	+ 0.33	+0.013	1 p. m ...	— 0.06	—0.002	.....	.....
1 a. m	+ 0.19	+0.007	.....	.....	2 p. m ...	— 0.56	—0.022	— 0.97	— 0.038
2 a. m	— 0.10	—0.004	— 0.40	—0.016	3 p. m ...	— 1.04	—0.041	— 1.20	— 0.047
3 a. m ...	— 0.40	—0.016	— 0.53	—0.021	4 p. m ...	— 1.17	—0.046	— 1.17	— 0.046
4 a. m	— 0.46	—0.018	— 0.43	—0.017	5 p. m ...	— 1.09	—0.043	— 0 93	— 0.037
5 a. m	— 0.36	—0.014	.....	.....	6 p. m ...	— 0.89	—0.035	— 0.60	— 0.024
6 a. m	— 0.15	—0.006	+ 0.17	+0.007	7 p. m ...	— 0.55	—0.022	.....	.....
7 a. m	+ 0.22	+0.009	.....	.....	8 p. m ...	— 0.16	—0.006	+ 0.30	+ 0.012
8 a. m ...	+ 0.77	+0.030	+ 1.10	+0.043	9 p. m ...	+ 0.25	+0.010	+ 0.63	+ 0.025
9 a. m	+ 1.16	+0.046	+ 1.23	+0.048	10 p. m ..	+ 0.48	+0.019	+ 0.80	+ 0.032
10 a. m ...	+ 1.26	+0.050	+ 1.18	+0.044	11 p. m ..	+ 0.60	+0.024	+ 0.57	+ 0.023
11 a. m ...	+ 1.03	+0.041	.....	.....	Midnight.	+ 0.53	+0.021	+ 0.33	+ 0.013
Noon	+ 0.61	+0.024	+ 0.07	0.000					

The signs printed with the departures on page 202 are really those appropriate to the reduction of any given hourly mean to the daily mean pressure, and the word *reduction* should be substituted for *departure* in the diagram on page 201. By interchanging the plus and minus signs, departures are converted into reductions, or vice versa. The figures in the present table are departures properly so-called and *not* reductions.—ED.

TORNADO OBSERVATIONS.

By A. H. GALE, Voluntary Observer at Bassett, Rock County, Nebr., dated July 28, 1899.

Wednesday, July 5, the adjoining county of Brown was visited by a tornado at 5:20 p. m., central time. The wind during the day at this station (Bassett, latitude 42° 36′ longitude 99° 55′ west) was southwest, strong in the a. m. and light in the p. m.; humidity high. Temperature 77° at 9 a. m., 90° at 2 p. m. Visited path of storm on 7th and rode over track, interviewing persons near by who witnessed it and also suffered.

Mr. A. Brown, 5½ miles northwest of Johnstown, saw it form; was at work in his barnyard, noticed it coming across his field as a light summer whirlwind such as is noticed on any still hot day. Air at the time was calm. Mr. Brown says he was harnessing a horse at the time, and as the light whirl passed him it gently lifted the straw edges of the roof of his cow shed, but had not enough strength to lift his hat, and passed on. At this point it was devoid of any color, and was mainly noticed by the whirl it made among the grass, straw, and chaff on the ground; he watched its onward movement indifferently, and soon saw it gather a color which made it definable. He then paid close attention to it and noticed it becoming black, angry, and gyrating vigorously, chips, straws, and dirt fell into it, and were absorbed by it and a smoky veil began to envelop the whirling column as it mounted upward. At the same time a funnel began to lower itself from a turbulent low-hanging cloud of an area of about forty acres; the column and funnel soon connected and with this union the "thing" took on a terrifying aspect; up to this time he had no feeling of apprehension. When the whirl passed him he said he was aware of its passage only by its action on the ground. No color. A black cloud above, in commotion, followed the whirl on the ground, which latter was eight or ten feet in diameter. This cloud was alone, separate, and clear from a higher strata of storm clouds above. When passing his point, and as long as within his line of view, he estimated the speed as 10 miles per hour, line of path east by south. I will say here that the entire path from start to end was 18 to 19 miles, and in that distance it made a southing from a due east course of 2¾ miles, and ranged from 1 to 3 rods in width. Two and one-half miles from Mr. Brown's point it crossed a large cornfield and here it received much coloring matter. That the affair was at this time in comfortable order was demonstrated by the shock it gave the first house it struck as it left the cornfield, Mr. John Strohm's. Mr. Strohm and his family saw it as it rose along the slant of the cornfield to his house on its edge, and dove for the cellar. The destruction at this place was complete; house of heavy logs, windmill and tower, and stable, in all seven buildings, completely leveled to the ground, fences upset, broken down. Fence wire woven and interwoven with broken up lumber, straw, débris of all sorts, plastered with mud. Every fence post standing in the track formed a dam around which was massed débris of everything imaginable, the whole daubed with mud; it was a picture of desolation and ruin—dismal in the extreme.

The storm struck the plantation from the west and its main track runs to the east by north down through a "draw" in which most of the trash lodged. Evidently the spout struck the place with its front face, and was not over 30 feet wide at contact. A twinebinder machine 20 feet to south of house was undisturbed. From this place the path of the vortex or storm tube was southeast by east to the place of William Lockmiller, 2½ miles. His house, a frame with an addition, neatly and strongly constructed, on brick foundation, was slid off of underpinning 10 feet to east and 5 feet to north, the two chimneys torn off, the bricks thrown to the east, two strips of shingles with the porch roof on west side of house torn off, all the shingles on east and north side have one corner broken off as one would break off the corner of the cover of a book; the roof being painted red, the broken corners showing the white wood in contrast, gave this roof a singular appearance. The barn, 50 feet south of the house, was also slid over its underpinning square to the east, but not otherwise disturbed. It was at this house that Mrs. Lockmiller was killed. She was in the cellar under the house with the children, and becoming anxious for a boy who was in the barn, started out to call him to safety, when the blast reached the house and, shoving it from the foundation, caught her coming up the cellar steps between the sills and cellar walls, crushing her to death. Had the family remained either in the house or cellar quietly, no one would have been injured. The fan and wheel of the windmill, 40 feet to the east of the house, were carried away, the tower left undisturbed. It is evident the vortex passed close to the north side of the house, as its track through the garden closely adjoining is clearly defined, and the movement of the house and barn and the observed damage were clearly caused by the inward rush of air toward the center of the whirl; shingles on roof, mud spatters, etc., clearly show this. A similar condition and effect were noted at a school house further on near end of path. Direction of vortex path at this point east-southeast.

De Long's place, next in the path of the storm, 2½ miles north of Ainsworth, is a total ruin. The house, a strong one of hewn logs, stables, windmill, and outbuildings went to general ruin. Main part of débris at this place went to the southeast, the house appeared to have been lifted clear off site and strewn over the prairie to the southeast; part of the roof was carried due north and parts to the west; the northeast quadrant shows but little débris. Mr. De Long and family were in the cellar when the house lifted. At this place direction of path was southeast for one-half mile from the house, then its course was due east. No hail or rain fell until after passing, and then both occurred. De Long says while in the cellar the house appeared to be lifted bodily, with strong upward suction (Strohm says he did not notice any upward draft), so much so that he cautioned his wife to hold hard to the children, fearing the upward pull might draw them out of the cellar. His dog was in the house and went away with it, and after the storm passed he came back from across the fields to the westward.

Mr. Trotter's place, about four miles east of De Long's, was the next place in the path of the storm destroyed. Here the destruction was complete. Most of the débris from this house (of frame construction) was thrown to the south and east, a small portion to the north and west; a trail of dish closet furniture described a section of a circle in above direction; the full circle about 4 rods in diameter. A portion of roof landed 250 yards toward the southwest, nearly at right angles to track, and smashed into kindling. Boards, sticks, etc., scattered about pointing lengthwise and from center of disturbance. A hay-covered stable and a straw field, 300 feet east of the house, by a small pool of water, were uninjured. Vortex appeared to catch the house on northwest corner. Observers state that they saw this house rise bodily into the air, whirl about in the funnel, and explode or melt into fragments. The appearance of the ruins indicates this to have occurred.